

CLAIMS

1. A treatment system comprising:

5 an electrochemical device comprising a first compartment and a second compartment;

a first liquid circuit fluidly connecting a first compartment inlet and a first pump;

a second liquid circuit fluidly connecting a second compartment outlet to a second compartment inlet and a second pump; and

10 a third liquid circuit fluidly connecting the second compartment inlet and the second pump.

2. The treatment system of claim 1, further comprising a first filter device fluidly connected to the first pump.

15 3. The treatment system of claim 2, further comprising a second filter device fluidly connected to the second pump.

4. The treatment system of claim 1, further comprising a point of entry fluidly connected to a water reservoir.

5. The treatment system of claim 1, further comprising a water distribution system fluidly connected to a water reservoir.

25 6. The treatment system of claim 1, further comprising a point of use fluidly connected to a water reservoir.

7. The treatment system of claim 1, further comprising a sensor measuring at least one operating parameter of the treatment system.

8. The treatment system of claim 1, further comprising a fourth liquid circuit fluidly connecting a water reservoir to the first compartment inlet and the first compartment outlet to the second compartment inlet.

5 9. The treatment system of claim 1, further comprising a post treatment system fluidly connected downstream of the electrochemical device and upstream of a point of use.

10. A treatment system comprising:

10 an electrochemical device comprising a first compartment comprising a first compartment outlet and a first compartment inlet and a second compartment comprising a second compartment outlet and a second compartment inlet, the electrochemical device fluidly connected to a point of entry;

a first pump fluidly connectable to the first compartment outlet and to the first compartment inlet;

15 a second pump fluidly connectable to the second compartment outlet and to the second compartment inlet; and

a circulation line fluidly connectable to at least one of the first or second compartment outlets.

20 11. The treatment system of claim 10, wherein the circulation line is fluidly connectable to at least one of the first and second pumps.

12. The treatment system of claim 10, further comprising a first valve fluidly connecting the circulation line to the first pump.

25 13. The treatment system of claim 12, further comprising a second valve fluidly connecting the circulation line to the second pump.

14. The treatment system of claim 10, further comprising a first valve fluidly connecting
30 the first compartment outlet to the circulation line.

15. The treatment system of claim 14, further comprising a second valve fluidly connecting the second compartment outlet to the circulation line.

16. The treatment system of claim 15, further comprising a controller actuating at least one of the first and second valves.

17. The treatment system of claim 10, further comprising a sensor measuring at least one operating parameter of the treatment system.

18. The treatment system of claim 10, further comprising a water reservoir fluidly connected to the point of entry and a water distribution system fluidly connected to the water reservoir.

19. The treatment system of claim 10, further comprising a disinfectant source fluidly connectable to at least one of the electrochemical device, the circulation line, the first pump, and the second pump.

20. A method of treating a liquid comprising:

establishing a first liquid circuit having liquid to be treated flowing therein from a reservoir to a first compartment inlet of an electrochemical device through a first pump; establishing a second liquid circuit having a concentrating liquid flowing therein from a second compartment outlet of the electrochemical device to a second compartment inlet through a second pump; and

establishing a third liquid circuit having liquid to be treated flowing therein from the reservoir to the second compartment inlet through the second pump.

21. The method of claim 20, further comprising establishing a fourth liquid circuit having the concentrating liquid flowing therein from the first compartment outlet to the first compartment inlet through the first pump.

22. The method of claim 20, further comprising applying an electric field across the electrochemical device.

23. The method of claim 22, further comprising reversing a polarity of the applied electric field after establishing the third liquid circuit.

5 24. The method of claim 20, wherein establishing the third liquid circuit comprises actuating a first valve to direct the liquid to be treated to flow through the second pump.

25. The method of claim 24, further comprising actuating a second valve to direct the concentrating liquid to flow through the first pump.

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26. The method of claim 20, further comprising measuring at least one of a pressure, temperature, flow rate, pH, conductivity and composition of the liquid.

15 27. The method of claim 20, further comprising flushing the first and second compartments with the treated liquid.

28. The method of claim 20, further comprising flushing at least one of the first and second pumps with the treated liquid.

20 29. The method of claim 20, further comprising establishing a fourth liquid circuit having liquid from the reservoir flowing therein from the reservoir to the first and second compartments through the first and second pumps.

30. The method of claim 29, wherein the liquid from the reservoir has a negative LSI.

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31. The method of claim 20, further comprising delivering at least a portion of the treated liquid to a point of use.

30 32. The method of claim 31, further comprising post treating the treated liquid prior to delivering the treated liquid to the point of use.

33. The method of claim 20, further comprising disinfecting at least a portion of any component of any of the first liquid circuit, the second liquid circuit and the third liquid circuit.

5 34. A method of treating water comprising:

passing at least a portion of water to be treated through a depleting compartment of an electrochemical device through a first pump to produce the treated water;

circulating a concentrating stream through a concentrating compartment of the electrochemical device through a second pump; and

10 circulating the concentrating stream through the concentrating compartment through the first pump.

35. The method of claim 34, further comprising passing at least a portion of the water to be treated through the second pump.

15 36. The method of claim 34, further comprising flushing the first compartment while flushing the second compartment.

37. The method of claim 34, further comprising flushing the first and second
20 compartments and the first and second pumps with treated water sequentially.

38. The method of claim 34, further comprising passing the water from the reservoir through the first compartment after passing the water through the second compartment.

25 39. A method of treating water comprising:

passing water to be treated through an electrochemical device to produce treated water;

storing at least a portion of the treated water in a water reservoir; and

30 flushing a concentrating compartment of the electrochemical device with the treated water.

40. The method of claim 39, wherein the treated water has a negative LSI.

41. The method of claim 39, further comprising flushing the depleting compartment.

42. The method of claim 41, wherein flushing the depleting compartment is performed
5 during flushing the concentrating compartment.

43. The method of claim 39, wherein flushing the first compartment and the second
compartment comprises flushing the first and the second compartment sequentially.

10 44. The method of claim 39, wherein flushing the first compartment and the second
compartment comprises flushing the first and second compartments with treated water in
parallel flow.

45. The method of claim 39, wherein flushing the first compartment and the second
15 compartment comprises flushing the first and second compartments with treated water in
series flow.

46. The method of claim 39, further comprising exposing the treated water to actinic
radiation or ozone.

20 47. The method of claim 39, further comprising passing the treated water through a
microfiltration or an ultrafiltration apparatus.

48. The method of claim 39, further comprising exposing a disinfectant to at least one of
25 the electrochemical device and the water reservoir.

49. A method of facilitating water purification comprising:
providing an electrochemical device comprising a first compartment and a second
compartment;

30 providing a first pump fluidly connectable to at least one of a water reservoir, a first
compartment outlet and a first compartment inlet;

providing a second pump fluidly connectable to at least one of the water reservoir, a second compartment outlet and a second compartment inlet; and

providing a circulation line fluidly connectable to at least one of the first and second compartment outlets.

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50. A treatment system comprising:

an electrochemical device comprising a first compartment and a second compartment;

10 means for flowing a liquid to be treated from a water reservoir through the first compartment and circulating a concentrating liquid through the second compartment; and

means for flowing the liquid to be treated from the water reservoir through the second compartment and circulating the concentrating liquid through the first compartment.

15 51. The treatment system of claim 50, wherein the electrochemical device comprises an electro-dionization device.